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MERCURY

"Silver" to the miner, quicksilver to the geologist, or mercury to the men of science and industry, is an extremely useful element of daily commerce and a valuable strategic metal in the defense program of our country. In the past, approximately 88 percent of the mercury produced in the United States has been obtained from deposits in California. The mercury mines of our State have produced more than two and two-thirds million flasks valued at $160,000,000 between the beginning of recorded production in 1850 and the end of 1956. The cumulative value of mercury production in California has been exceeded only by that of gold and of copper, among the metallic minerals of the State.

Geologic Occurrence

The principal mercury mines lie within the Coast Ranges province of California where they are distributed along a 350-mile belt extending from central Lake County southeastward to southeastern Santa Barbara County. The deposits are generally confined to areas underlain by rocks of the Franciscan group (Upper Jurassic) within this province. The Franciscan group of rocks includes sandstone, shale, chert, conglomerate and limestone lenses, greenstone (altered lavas, tuffs and breccias), associated serpentine and some metamorphic rocks.

Slightly over 50 percent of the larger mercury deposits in California occur in altered serpentine (silica-carbonate rock), and an additional 30 percent occur in the sedimentary rocks of the Franciscan group (Upper Jurassic) with which the serpentine is associated. Mercury ores also occur in the Knoxville (Upper Jurassic) sedimentary rocks and in younger Lower Cretaceous sedimentary and Tertiary volcanic rocks. Relatively small amounts of cinnabar have been obtained from hot springs and placer deposits in the state.

The high degree of fracturing in the Franciscan rocks and in the serpentine has favored deposition in these rocks. In general the mercury minerals have formed in the interstices of porous or brecciated rocks. In many places the ore is especially rich beneath such impervious material as fault-gouge, clay shale, or dense volcanic rock. The silica-carbonate rock with which many deposits of mercury minerals are associated is commonly called "quicksilver rock". This rock is an alteration product of serpentine and is composed largely of chalcedony, quartz, and various carbonates. It is more wide-spread than the mercury mineralization, however, and cannot be used as a reliable prospecting guide.

Mercury ore bodies are irregular and contain cinnabar or metacinnabar that fills fractures or voids, or has replaced the host rock. Many ore bodies have been formed by the concentration of primary minerals in porous rocks capped by relatively impervious rocks. Others are replacement deposits of silica-carbonate and related rocks; still others have been deposited at or very near the surface by hot springs. Bodies of disseminated ore exist at some mines.

Although the deposits may be found in rocks of various geologic ages, the time of deposition of the ore minerals appears to be quite late--late Pliocene, Pleistocene, and even Recent. Mercury deposits appear to be related to volcanic activity, and are frequently precipitated from the waters of hot springs and fumaroles. Cinnabar is formed at comparatively shallow depths. The characteristic irregular form of the ore bodies is largely determined by the structure and fracturing of the enclosing rocks. Many of the deposits have flat dips and do not extend to any great depth.

Although the mercury deposits of the Coast Ranges province have formed under similar geologic conditions, they show marked differences in the character and grade of the ore and the nature of the gangue and host rock, as well as in the age of the host rock and size of the ore bodies.

Mineralogy

Cinnabar (HgS) is by far the most important ore mineral of mercury, but native mercury and metacinnabar (HgS) occur in economic quantities. More than 20 other minerals also contain mercury. Of these, amalgam (AuHg), tiemannite (HgSe), coloradoite (HgTe), calomel (HgCl), eglestonite (Hg_4Cl_2O), and montroydite (HgO), have been noted in California.

Cinnabar is recognized by its red color, red streak, high specific gravity, and adamantine luster. Cinnabar, when carefully heated in the open tube, gives sulfurous fumes and metallic mercury, which condenses in minute globules on the cold walls of the tube. In the closed tube alone the mineral gives a black sublimate of mercuric sulfide, but with dry sodium carbonate one of metallic mercury.

Mercury deposits contain few other metallic minerals. Pyrite or marcasite is generally present, and stibnite is locally abundant. The principal gangue minerals are quartz, opal, chalcedony, calcite and dolomite.